

# Business Day

The New York Times

## For Shakespeare, Just Log On

### Large PC Libraries Are Being Developed

By JOHN MARKOFF

The development of a nationwide data network will allow personal computer users to tap sources as large as the Library of Congress or receive their own personalized electronic newspapers.

Several innovations, taken together, have already demonstrated that searching vast computer data bases can be easier than consulting a card catalogue, and not nearly as difficult or expensive as computer searches are today. Computer users might read some Dickens more readily than they could check out David Copperfield from the local library.

Those in the industry say that users with little computer skills will soon be able to search through several terabytes of information, or several trillion characters of text, in seconds. The Library of Congress, with 80 million items, contains an estimated 25 terabytes of information.

Already, an experimental computer library has linked 150 universities to 40 sources of information, ranging from National Institutes of Health data to corporate documents and Shakespeare's plays. New software allows users to browse or zero in on particular information.

As methods of retrieving information are standardized and perfected, industry executives and computer scientists say, thousands of new services, ranging from electronic newspapers to the computer equivalent of free public libraries, will blossom. "Everyone is realizing how important it is to get into the mass market for information," said Thomas Koulopoulos, president of Delphi Consulting Group, a Boston market research firm.

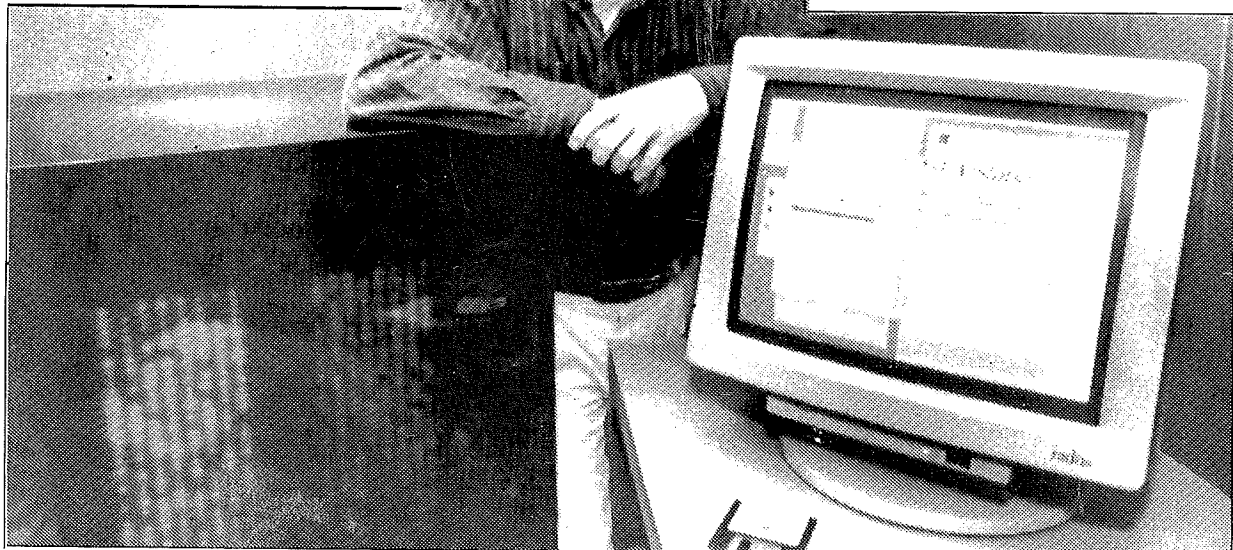
Such ready access to huge amounts of computerized information has been the dream of many in the industry. But a lack of computing power, effective software and high-speed digital networks has stalled progress until recently.

If many of the technical problems are being solved, major business and political disputes remain. The researchers acknowledge that they must resolve several questions of privacy and pricing before they can put the new methods to commercial use.

Many sources of information, like government documents, might be available free, but other services, including electronic newspapers, will be available only to those who pay. The industry has yet to settle on ways to protect and charge for intellectual property in a computer network where information can be copied instantly. But to encourage progress, the Thinking Machines Corporation, a Cambridge, Mass., supercomputer manufacturer, has made its software available at no charge.

Some industry enthusiasts say the new technology will transform the

Continued on Page D5



Mike Theiler for The New York Times

Brewster Kahle was the leader of the development team at the Thinking Machines Corporation for a nationwide computerized library system. His team's software links a CM2A Connection Machine, left,

with a personal computer or work station like the Apple Macintosh II at right. Using high-speed data highways, the two machines can function together although they may be thousands of miles apart.

## BUSINESS TECHNOLOGY

# For Shakespeare, Just Log On

Continued From First Business Page

way computerized information is sold. Mitchell Kapur, the founder of the Lotus Development Corporation, predicts the growth of a new industry as significant as the personal computer business. Some companies, like Dow Jones & Company, that already provide computerized information over telephone lines have taken part in developing the new computer library.

### The Search Is Simplified

In 1989, Thinking Machines enlisted the support of Dow Jones, Apple Computer Inc. and the KPMG Peat Marwick accounting and consulting firm to design the computer library, called Wide Area Information Servers, or WAIS (pronounced ways). The system permits computer users to quickly search through a huge volume of information even if it is stored at several distant locations.

The system lets users conduct searches by typing common English phrases instead of more complicated computer commands. While current systems like Dialog and Nexis require users to specify precisely the information they want, the new system can respond to a user's inferences. It initially presents a sample list of documents. The user chooses one or several, and then a "relevance feedback" program presents other documents most like the ones selected.

"This solves the problem of how to

It will soon be possible to search through millions of items in seconds.

get to the information you need, getting not too much and not too little," said Esther Dyson, editor of Release 1.0, a computer industry newsletter.

This is a sharp contrast to the way services operate today, Ms. Dyson said. A computer user may need to call seven or eight separate data bases depending on the kind of information needed.

The WAIS system lets users of Apple personal computers harness a network of Thinking Machines supercomputers and smaller "server" computers to search data bases stored by Dow Jones, KPMG and several corporations and universities. Users can also read electronic mail, enter their corporate electronic libraries and summon up a wide variety of documents, newspapers and magazines.

### A 'Corporate Memory'

At Thinking Machines, the WAIS system serves as a "corporate memory," allowing employees to retrieve memos, documents and other inter-

nal information. Employees who may not be working together can share expertise.

"If someone did something in Los Angeles and I'm sitting in San Francisco, I may not know about the work," said Robin Palmer, a senior manager at Peat Marwick.

WAIS delivers information over the Internet, a collection of 2,600 high-speed public and private computer networks. This Government-sponsored system of data highways is rapidly being improved and turned to commercial uses.

The market for software that allows the rapid retrieval of computerized text is small but growing, according to industry analysts. In 1989, the United States had fewer than 60,000 users; by the next year, total sales were about \$120 million. The Delphi Consulting Group expects the market to grow to 160,000 users and \$235 million by 1992.

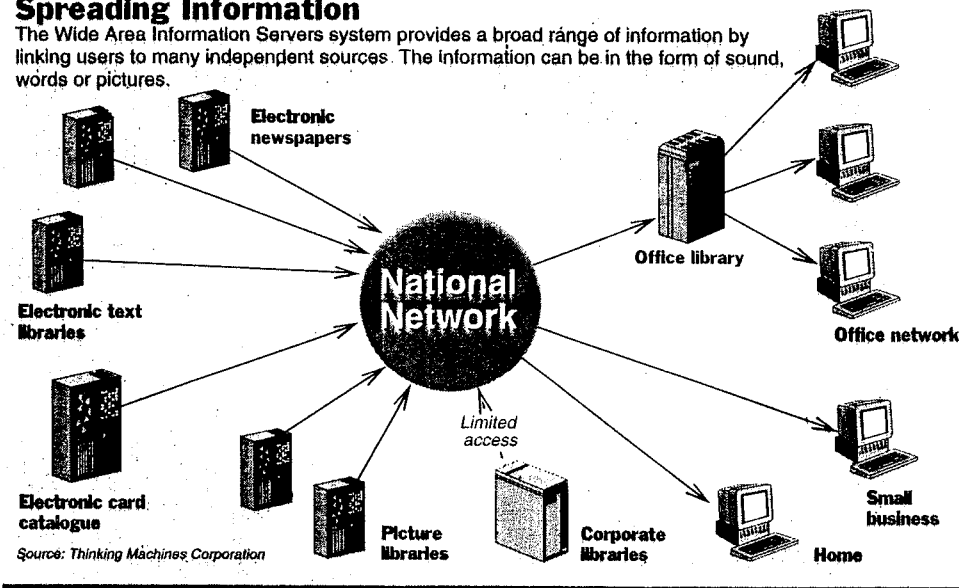
"Information retrieval technology is starting to spread from supercomputers all the way down to personal computers," said Brewster Kahle, a Thinking Machines scientist who has led the WAIS experiment.

The WAIS system is built on a procedure for retrieving information developed by librarians who initially set out to computerize their card catalogues. The procedure — known in the field as Z39.50 — now has the support of the Library of Congress, Apple, Sun Microsystems Inc., Next Inc., Dow Jones and Mead Data Central.

In the future, a special directory or

## Spreading Information

The Wide Area Information Servers system provides a broad range of information by linking users to many independent sources. The information can be in the form of sound, words or pictures.



"white pages" will keep an up-to-date list of all the separate sources on the network.

Apple has its own electronic library project, borrowing its name, Rosebud, from the movie "Citizen Kane." The three-year-old project is based on the WAIS system, but adds features including the ability for a user to develop a personalized electronic newspaper.

Rosebud uses special programs —

called "reporters" — that let customers specify the kinds of information and news they want to retrieve from the WAIS system every day. Researchers at Apple's Advanced Technology Group said that in the future the necessary retrieval software might be a standard part of a computer's operating system.

They expect improvements in the Internet computer network to greatly lower the cost of information

searches, promoting the introduction of many new services. The Government proposes to expand and improve Internet by financing a National Research and Education Network, or NREN, that could extend a high-speed computer links into schools and communities across the country.

"With things like NREN, everything could change overnight," said Tim Oren, an Apple researcher.